The bibliography is good but needs some additions. A detailed index would add to the usefulness of the paper. This paper, together with the account of the Borkum dunes, may well be taken as a model for future studies of dune areas.

COLLIER COBB

A TEXTBOOK OF SEISMOLOGY

CHARLES DAVISON. **A Manual of Seismology.** xi and 256 pp.; maps, diagrs., ills., index. (Cambridge Geological Ser.) The University Press, Cambridge, 1921. 8½ x 6 inches.

Dr. Davison's contributions to the study of earthquakes are well known, and we welcome this volume from him. His "aim has been to give an outline of our present knowledge" of the subject; and this he has accomplished very well. He has given clear accounts of the principle of seismographs, of the nature of earthquake motion, of the propagation of the disturbance, of the geographical distribution of earthquakes—in short, of earthquake phenomena in general. Students of seismology will miss a discussion of the underlying principles of the subject and of its many still unsettled problems; but the length of the book and the general purpose of the series to which it belongs make this impossible. A few ideas are expressed with which the reviewer does not agree; for instance, Davison's conceptions of twin earthquakes. He supposes two fractures of the rock, at points not far apart, to take place within an interval of time so short that the second fracture could not be influenced by the vibrations from the first. Much stronger evidence than we have is necessary to establish so improbable a coincidence. In common with some other seismologists he thinks the buckling of railroad lines in Baluchistan at the time of the earthquake in 1892 indicated a compression of the earth's crust; whereas it was shown in the report of the California earthquake of 1906 that the movement on the fault caused just such an apparent compression without any reduction of the area of the region. Davison regards the first appearance of seismic sea waves at the shore as a depression of the water; this is certainly very general, but there are many instances where the elevation of the water occurs first. The destructive effects of earthquakes on houses and other structures are not treated, probably for lack of space and because these effects may be considered as belonging to applied seismology rather than to the pure science itself.

HARRY FIELDING REID

A NEW ESTIMATE OF OCEAN DEPTHS

ERWIN KOSSINNA. **Die Tiefen des Weltmeeres.** 70 pp.; diagrs. *Veroffentl. des Inst. für Meereskunde*, N. F., A. (Geographisch-naturwissenschaftliche Reihe), Heft 9. E. S. Mittler & Son, Berlin, 1921. 10½ x 7 inches.

This is the latest of the many attempts to estimate the mean depth of the ocean. There are no new methods devised, but the work has evidently been very painstaking, and the results are probably very near the truth. Groll's equivalent-area maps of the oceans, corrected by additional observations made since they appeared, are the basis of the work. The method used was to print Groll's bathymetric lines on paper ruled to square millimeters, and to count the number of square millimeters between successive lines, estimating to tenths. This was done for areas 5° on the side, over all the oceans, and checked by counting the millimeters in each area as a whole. The area corresponding to one square millimeter was not determined by the scale of the map, but by dividing the area between the bounding parallels and meridians, as calculated on a Bessel's spheroid, by the total number of square millimeters counted in it. By this means errors due to inaccuracies in ruling the paper, or to shrinkage or expansion, were avoided. The errors that could not be avoided are due to inaccuracies of the maps and to lack of data for even large areas of the oceans, but it is not likely that Kossinna's results will be materially affected when these deficiencies are made up. The mean depth that he deduces for all the oceans is 3,800 ± 100 meters, somewhat greater than the best estimates made earlier. His measures can evidently be used for other purposes; for instance, to determine the ratio of land and water on the globe. This he finds to be 1 : 2.43; agreeing with Krümmel and differing somewhat from Wagner (1 : 2.54). He also applies his measures to find the ratio of land to water in the northern and southern, the land and the water, hemispheres, and to determine the areas and mean depths of all the oceans and seas of the earth. He combines with